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Original Article

Gender Differences in Health-Related Behavior Patterns among Older Adults in Indonesia: A Latent Class Analysis

Lisa Wahidatul Oktaviani [a,b], Hui-Chuan Hsu [a,c *], Yi-Chun Chen [c,d]

[a] *School of Public Health, Taipei Medical University, Taipei, Taiwan,* [b] *Department of Public Health, Universitas Muhammadiyah Kalimantan Timur, Samarinda, Indonesia,* [c] *Research Center of Health Equity, College of Public Health, Taipei Medical University, Taipei, Taiwan,* [d] *School of Nutrition and Health Science, Taipei Medical University, Taipei, Taiwan*

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SUMMARY

Background: Health-related behavior patterns may affect health outcomes. However, there is little research for about health-related behavior patterns in Southeast Asia. The purpose of this study was to identify health-related behavior patterns among older adults in Indonesia and to examine the factors.
Methods: The data were obtained from the fifth wave of the Indonesia Family Life Survey collected in 2015. Adults who were age 60 or older were included (n = 2930). Health-related behaviors included smoking, physical activity, and dietary patterns. The data was analyzed using latent class analysis and logistic regression.
Results: Four classes each for older men were identified: smoking and high-calorie diet (20.8%), smoking and active (47.5%), nonsmoking (2.5%), and smoking and healthy diet (29.1%). Four classes for older women were also identified: high risk (8.8%), inactive (31.0%), moderate physical activity (37.7%), and healthy diet (22.5%). The related factors were different by gender.
Conclusion: Four lifestyles for older men and women respectively were identified. No completely healthy behavior group was identified. Gender differences imply that health inequality may exist. A gender-sensitive policy is suggested.

1. Introduction

Health-related behaviors (HRB) are related to health outcomes, such as mortality, chronic disease morbidity and mental health, especially for the older people.[1–3] A healthy lifestyle is defined as "collective patterns of health-related behavior based on choices from options available to people according to their life chances".[4] The most common HRBs are smoking, drinking alcohol, physical activity, and dietary patterns.[5] The person-centered methods are often used to identify different HRB patterns and to group individuals,[6–12] and the common groups reported in the existing research include healthy groups and multiple risk behavior groups.[13] However, the HRB patterns are little explored in Southeast Asia. Furthermore, the gender differences in the HRB patterns based on the role expectation in the culture may cause different risks to health outcomes for older people.

The factors that influence HRBs include age, gender, ethnicity, education, socioeconomic status, physical health and mental health.[5–15] Gender differences in HRBs can be explained by the knowledge gap or health literacy differences, differences in health beliefs, social role differences, and social disparities due to gender. Men are more likely to smoke and drink alcohol, whereas women had more risks in physical inactivity and unhealthy diet.[7,8,13] Higher socioeconomic status and education are often related to HRBs.[7–15] Social participation or social engagement are also factors related to HRBs.[16]

The percentage of people who were age 60 years old or more has reached almost 9.0% of the population in Indonesia.[17] The high rate of smoking, low physical activity, and consuming fried food are noticed in the lifestyle for older adults.[18] Despite HRBs and related factors being explored in previous research, HRBs as a lifestyle pattern for older people in Southeast have not been identified yet. The purpose of this study was to identify different HRB lifestyle patterns by gender for older adults in Indonesia and to examine related factors.

2. Materials and methods

2.1. Data and sample

The data were obtained from the Indonesia Family Life Survey (IFLS)[19] from the RAND corporation, a nationally representative survey. The sampling for the IFLS was based on sampling households from the Indonesian population since 1993. Data collection was conducted by face-to-face interviews. In this study, we used the fifth wave of IFLS and selected older participants who were at least 60 years old. In total 2930 participants were included for analysis. The study was approved by the Institutional Review Board before the study was conducted (TMU-JIRB No. N202004087).

2.2. Measures

The HRB consisted of 3 kinds of behaviors: smoking, physical

* Corresponding author. School of Public Health, Taipei Medical University, No. 250, Wuxing Street, Taipei 11031, Taiwan, R.O.C.
E-mail address: gingerhsu@tmu.edu.tw (H.-C. Hsu)

activity, and dietary patterns. Smoking was defined as yes or no. Physical activity was measured by the brief International Physical Activity Questionnaire (IPAQ),[20] which asks about number of days spent on three items in the last 7 days: vigorous activities, moderate physical effort, and walking; then physical activity was coded as three levels: high, medium, or low. The dietary pattern was defined based on the results of a food intake questionnaire. Food intake was assessed by the Food Frequency Questionnaire (FFQ) to measure dietary intake.[21] The current FFQ used in the IFLS included 17 food items to assess food intake in one week.

Demographics included age, gender, education, marital status, monthly expenditures per person (by percentile), place of residence (rural or urban), health insurance (yes/no), and ethnicity (Javanese or non-Javanese), religion beliefs. The monthly expenditures were classified into 5 categories by percentiles. Level of education was defined as an ordinal variable: elementary school or lower, junior high school, senior high school, and college/university or above.

Chronic condition was defined as the cumulative number of morbidity of 14 chronic diseases. Depressive symptoms were measured by the Center of Epidemiological Studies Depression Scale-10.[22] Each item was coded from 0 to 3; a score of 10 or above indicated depressive symptoms.[23] Physical function was measured by the difficulties in performing Instrumental Activities of Daily Living (IADL), including shopping, preparing food, taking medicine, doing household chores, and managing money; higher scores indicated more difficulties. Self-rated health was measured by: general self-rated health rating, rating health compared with 1 year ago, compared health with the same age, expectations in next year, and health expectation to the next 5 years; the total score was from 5 to 22. Body mass index was coded as 4 groups (< 18.5, 18.5–24., 25–26.9, and ≥ 27). Cognitive function was measure by following question:[24] awareness of the date; awareness of the day of the week; self-reported memory; serially subtracting 7 from 100; word repeating of 10 nouns; and word recall of 10 nouns. The total score ranged from 0 to 32.

Social participation was assessed by participating in the arisan in the last 12 months (yes/no). An arisan is a group of people who collect money regularly in a specific period. The arisan offers a chance to save money, meet friends and increase social interaction.[25]

2.3. Analysis

The food items were first categorized to food categories by factor analysis. Then cluster analysis was used to group people into dietary patterns; the hierarchical clustering and then used K-means clustering were used in two steps to define the clusters. Three clusters were determined to represent the dietary patterns (Supplement Table 1 and 2).

Latent class analysis (LCA) was used to identify the HRB patterns as defined by three variables: dietary patterns, smoking, and physical activity. The SAS version 9.4 was used for the LCA analysis.[26] When the different types of HRB patterns were identified, multinomial logistic regression was applied to examine the factors related to the types of HRB patterns.

3. Results

The sample characteristics are presented in Table 1. Older men had higher smoking rate and higher physical activity than older women. The dietary patterns were not different by sex.

Latent class analysis was applied to categorize the HRB patterns. The men were identified according to 4 classes (Table 2): M1 (smoking and high-calorie diet, 20.8%) were more likely to smoke, more likely to have a high-calorie diet and more likely to have high or low physical activity. M2 (smoking and active, 47.5%) were those who smoked, exhibited an indulgent or healthy dietary pattern and had high physical activity. M3 (nonsmoking, 2.5%) were more likely to not smoke, exhibit a high-calorie dietary pattern and to have high physical activity. M4 (smoking and healthy diet, 29.1%) were more likely to smoke, have moderate or low physical activity and have a healthy or high-calorie diet.

The women were classified into 4 classes (Table 3): F1 (high-risk, 8.8%) were more likely to smoke, more likely to have a high-calorie diet and to have low physical activity. F2 (inactive, 31.0%) were more likely to be non-smokers, eating high-calorie diet and performing low physical activity. F3 (moderate physical activity, 37.7%) were those who were more likely be non-smokers, having an indulgent or healthy diet, and performing moderate or low physical activity. F4 (healthy diet, 22.5%) were more likely to not smoke, to have low physical activity and a healthy diet.

The factors related to the HRB patterns were examined by multinomial logistic regression. The reference group for men were the 'smoking and a healthy diet' group. For the men participants (Table 4), those who were in the M1 were more likely to have no spouse (OR = 1.63) and less likely to be overweight according to BMI (OR = 0.40). The participants in the M2 were more likely to live in rural areas (OR = 1.34) and less likely to be overweight according to BMI. And the male participants in the M3 were less likely to live in a rural area (OR = 0.39).

The reference group for women was the 'healthy diet' group (Table 5). F1 women were more likely to live in rural area (OR = 1.81), having no spouse (OR = 1.88), and having no social participation (OR = 2.45) compared with the F4. F2 women were less likely to be younger (OR = 0.67) and less likely to be non-Javanese (OR = 0.49). F3 compared with F4 were less likely to be non-Javanese (OR = 0.71), and more likely to have more chronic disease (OR = 1.20).

4. Discussion

There was usually a healthy HRB group among the individuals in previous research.[6,8,10,14] In this study, no completely healthy behavior group was identified. Among the male older adults, M3 that had a relatively healthy HRB group comprised only a very small percentage. However, the dietary pattern in this class was more likely to consume high-calorie food only. The other classes with a healthier diet (M2 and M4) were more likely to be smokers. For older women, the relatively healthy group was the moderate physical activity class with the characteristics of a healthy diet, nonsmoking, and moderate physical activity. And high-calorie only diet and indulgent diet are common in older men and women. If they also performed low physical activity, the risk for metabolic syndrome may be higher.

Older men were much more likely to smoke than women as previous research in Taiwan.[7,27] Smoking is associated with a masculine image for Indonesian men. On the contrary, the traditional culture considers a smoking woman of no good virtue, and families do not approve of women who smoke even when they are married. Living in rural areas was related to higher smoking rate. Smoking is often used as a means to build up personal relationships and increase closeness,[28] especially in rural areas. Even though the trend of liberation and increasing women's labor participation are related to increasing women's smoking rate,[27] this phenomenon is not observed in Indonesian older people.

Indonesian people have high fried and sweet food consumption, similar to the diets in Philippines and Malaysia.[29,30] Sweet food

Table 1
Descriptive characteristics of the sample.

Variables	Total Sample		Men	Women	p value
	N	Mean (SD) or %	Mean (SD) or %	Mean (SD) or %	
Smoking					< 0.001
No	1623	55.4%	20.0%	88.5%	
Yes	1307	44.6%	80.0%	11.5%	
Dietary pattern					0.275
Healthy diet	1007	34.4%	35.5%	33.5%	
Low vegetable/fruits diet	1002	34.3%	32.8%	35.6%	
High-calorie food diet	916	31.3%	31.7%	30.9%	
Physical activity					< 0.001
High	865	29.5%	35.6%	23.8%	
Moderate	729	24.9%	24.2%	25.5%	
Low	1336	45.6%	40.2%	50.7%	
Age					
60–64	1242	42.4%	42.0%	42.8%	
65–69	725	24.7%	25.3%	24.2%	
70–74	631	21.5%	21.0%	22.0%	
75+	332	11.3%	11.6%	11.0%	
Gender					
Men	1417	48.4%	---	---	
Women	1513	51.6%	---	---	
Religion					0.113
Islam	2559	87.3%	87.7%	87.0%	
Catholic	75	2.6%	2.3%	2.8%	
Protestant	143	4.9%	4.2%	5.6%	
Hindu	139	4.7%	5.3%	4.2%	
Budha	11	0.4%	0.4%	0.4%	
Konghucu	3	0.1%	0.2%	0.0%	
Education level					0.243
No education to elementary school	671	22.3%	24.0%	22.6%	
Junior high school	570	19.8%	19.3%	20.2%	
Senior high school	1214	42.1%	43.1%	41.2%	
College, university and above	425	14.8%	13.5%	15.9%	
Monthly expenditure					0.561
$6–$41	766	27.8%	26.8%	28.8%	
$42–$60	592	21.5%	22.3%	20.7%	
$61–$83	529	19.2%	19.8%	18.6%	
$84–$128	468	17.0%	16.4%	17.6%	
$129–$1600	398	14.5%	14.6%	14.3%	
Marital status					< 0.001
No spouse	1030	35.2%	12.8%	56.0%	
Having spouse	1900	64.8%	87.2%	44.0%	
Place of residence					0.719
Rural	1597	54.5%	45.9%	45.1%	
Urban	1333	45.5%	54.1%	54.9%	
Ethnicity					0.187
Javanese	1393	47.5%	51.2%	53.7%	
Non-Javanese	1537	52.5%	48.8%	46.3%	
Health Insurance					0.266
No	1552	53.0%	52.0%	54.0%	
Yes	1374	47.0%	48.0%	46.0%	
Self-rated health	2930	13.75 (1.59)	13.80 (1.57)	13.71 (1.62)	0.136
Chronic disease number	1812	0.84 (1.14)	0.78 (1.10)	0.95 (1.09)	< 0.001
Cognitive function	2928	13.38 (4.64)	14.07 (4.34)	12.75 (4.82)	< 0.001
Depression symptoms					0.116
No	2449	83.6%	84.8%	82.5%	
Yes	480	16.4%	15.2%	17.5%	
IADL difficulties	2930	1.28 (2.91)	1.24 (2.79)	1.30 (3.03)	0.588
BMI					< 0.001
< 18.5	513	17.7%	19.9%	15.7%	
18.5–24.9	1644	56.8%	63.3%	50.8%	
25–27	320	11.1%	7.6%	14.3%	
≥ 27	415	14.3%	9.1%	19.2%	
Social participation					< 0.001
No	2167	74.1%	82.6%	66.1%	
Yes	758	25.9%	17.4%	33.9%	

Note: N = 2930. Missing values and proxy participants were excluded.

Table 2
Probabilities of HRB patterns by latent class analysis for older men.

HRB	M1: Smoking and high-calories diet (20.8%)	M2: Smoking and active (47.5%)	M3: Non-smoking (2.5%)	M4: Smoking and healthy diet (29.1%)
Smoking				
Yes	1.0000	0.8367	0.0017	0.7602
No	0.0000	0.1633	0.9983	0.2398
Dietary pattern				
Indulgent diet	0.0059	0.5022	0.1975	0.2493
High-calories only diet	0.9941	0.0032	0.8025	0.3504
Healthy diet	0.0000	0.4946	0.0000	0.4004
Physical activity				
High	0.5248	0.5276	0.6681	0.0031
Moderate	0.0298	0.1068	0.1681	0.5373
Low	0.4453	0.3656	0.1638	0.4595

Table 3
Probabilities of HRB patterns by latent class analysis for older women.

HRB	F1: High risk (8.8%)	F2: Inactive (31.0%)	F3: Moderate physical activity (37.7%)	F4: Healthy diet (22.5%)
Smoking				
Yes	0.6505	0.0000	0.1042	0.0000
No	0.3495	1.0000	0.8958	1.0000
Dietary pattern				
Indulgent diet	0.1191	0.2163	0.5125	0.3017
High-calories only diet	0.5644	0.7542	0.0050	0.0252
Healthy diet	0.3165	0.0295	0.4825	0.6731
Physical activity				
High	0.3006	0.2157	0.1903	0.3064
Moderate	0.1667	0.2431	0.4864	0.0000
Low	0.5327	0.5412	0.3233	0.6936

Table 4
Related factors to HRB patterns by multinomial logistic regression for older men (odds ratios and 95% CI).

Factors	M1: Smoking and high-calories diet	M2: Smoking and active	M3: Non-smoking
Age			
70+	0.93 (0.65–1.32)	0.88 (0.65–1.18)	0.69 (0.29–1.65)
60–69	1	1	1
Education	0.94 (0.80–1.10)	0.91 (0.80–1.04)	1.15 (0.80–1.66)
Ethnicity			
Non-Javanese	0.75 (0.53–1.05)	0.83 (0.63–1.10)	0.67 (0.31–1.42)
Javanese	1	1	1
Place of residence			
Rural	1.25 (0.88–1.74)	1.34 (1.01–1.77)*	0.39 (0.16–0.95)*
Urban	1	1	1
Marital status			
No spouse	1.63 (1.04–2.54)*	0.83 (0.55–1.25)	0.73 (0.21–2.53)
Having spouse	1	1	1
Health insurance			
No	1.15 (0.82–1.61)	1.07 (0.81–1.41)	0.74 (0.35–1.58)
Yes	1	1	1
Monthly expenditure			
$6–$41	1.12 (0.64–1.97)	0.87 (0.55–1.36)	1.98 (0.54–7.21)
$42–$60	1.42 (0.80–2.51)	0.85 (0.55–1.40)	2.06 (0.56–7.56)
$61–$83	0.80 (0.45–1.43)	0.68 (0.43–1.07)	1.94 (0.54–6.93)
$84–$128	0.75 (0.40–1.41)	1.08 (0.67–1.71)	1.17 (0.27–4.99)
$129–$1600	1	1	1
Chronic diseases	1.00 (0.85–1.19)	1.11 (0.97–1.26)	0.88 (0.59–1.30)
Cognitive function	0.97 (0.93–1.01)	0.98 (0.95–1.01)	0.99 (0.90–1.09)
IADL difficulties	1.01 (0.96–1.07)	0.98 (0.93–1.12)	0.83 (0.63–1.10)
Self-rated health	0.99 (0.89–1.09)	1.028 (0.94–1.12)	1.02 (0.78–1.32)
BMI			
< 18.5	1.30 (0.87–1.94)	1.06 (0.74–1.50)	0.50 (0.14–1.77)
18.5–24.9	1	1	1
25–26.9	0.49 (0.25–0.98)*	0.51 (0.31–0.84)**	0.98 (0.30–3.19)
≥ 27	0.78 (0.42–1.46)	0.78 (0.49–1.26)	1.11 (0.34–3.56)
Depression			
Depressive	0.89 (0.56–1.41)	0.99 (0.68–1.43)	0.68 (0.19–2.40)
Not depressive	1	1	1
Social participation			
No	1.30 (0.82–2.07)	1.10 (0.77–1.58)	1.00 (0.40–2.47)
Yes	1	1	1

Note: The reference category of the dependent variable for males was M4 (smoking and healthy diet).
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5
Related factors to HRB patterns by multinomial logistic regression for older women (odds ratios and 95% CI).

Factors	F1: High risk	F2: Inactive	F3: Moderate physical activity
Age			
70+	1.37 (0.85–2.21)	0.67 (0.47–0.95)*	0.82 (0.59–1.15)
60–69	1	1	1
Education	0.85 (0.68–1.05)	1.06 (0.92–1.23)	0.98 (0.85–1.13)
Ethnicity			
Non-Javanese	0.64 (0.40–1.02)	0.40 (0.29–0.55)***	0.71 (0.52–0.98)*
Javanese	1	1	1
Place of residence			
Rural	1.81 (1.13–2.90)*	1.00 (0.72–1.39)	0.77 (0.56–1.06)
Urban	1	1	1
Marital status			
No spouse	1.88 (1.16–3.05)**	1.17 (0.85–1.60)	0.99 (0.73–1.33)
Having spouse	1	1	1
Health insurance			
No	0.95 (0.61–1.50)	1.33 (0.97–1.82)	0.92 (0.68–1.24)
Yes	1	1	1
Monthly expenditure			
$6–$41	1.03 (0.49–2.16)	1.62 (0.95–2.76)	1.06 (0.65–1.73)
$42–$60	0.65 (0.29–1.44)	1.42 (0.83–2.43)	0.70 (0.42–1.16)
$61–$83	0.64 (0.27–1.50)	1.20 (0.68–2.12)	1.26 (0.76–2.08)
$84–$128	1.35 (0.61–2.95)	1.27 (0.71–2.26)	1.35 (0.81–2.25)
$129–$1600	1	1	1
Chronic diseases	1.13 (0.90–1.43)	1.14 (0.97–1.34)	1.20 (1.04–1.40)*
Cognitive function	0.97 (0.92–1.03)	1.00 (0.96–1.04)	1.00 (0.96–1.03)
IADL difficulties	1.00 (0.93–1.06)	0.98 (0.93–1.03)	0.92 (0.87–0.98)**
Self-rated health	0.93 (0.81–1.07)	0.96 (0.87–1.06)	1.01 (0.92–1.10)
BMI			
< 18.5	1.19 (0.67–2.11)	1.17 (0.75–1.82)	1.01 (0.65–1.57)
18.5–24.9	1	1	1
25–26.9	0.56 (0.26–1.18)	0.87 (0.55–1.39)	0.91 (0.59–1.41)
≥ 27	1.21 (0.63–2.32)	0.79 (0.52–1.21)	0.88 (0.60–1.31)
Depression			
Depressive	1.15 (0.66–2.00)	0.93 (0.62–1.40)	0.98 (0.66–1.44)
Not depressive	1	1	1
Social participation			
No	2.45 (1.32–4.54)**	1.07 (0.75–1.53)	0.87 (0.62–1.22)
Yes	1	1	1

Note: The reference category of the dependent variable for females was F4 (healthy diet).
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

is often consumed at breakfast, and fried food are common in the daily diet. Environmental factors may encourage a high-calorie diet, including urbanization, increased income within the community, and the spread of fast food outlets. Older adults who had a healthy dietary pattern were more likely to be non-Javanese. The Javanese culture encourages cooking food by frying, whereas non-Javanese people usually cook food by boiling. Older people without spouse were more likely to be eat high-calorie diet. Married people usually have regular meals with family, and older men usually do not cook and thus the nutrition intake may be irregular for those who do not have spouse. Having social participation was more likely to have a high-calorie food dietary pattern, probably people eat fried and sweet snacks when they have social interactions in arisans.

Men had a higher possibility to perform high level of physical activity than women, consistent with previous studies.[7,8,15] The physical inactivity rate of older people in Indonesia was higher than that in southeast Asia,[31] and the gender difference in physical activity was also larger too. In Indonesia, women are not encouraged to exercise in public in the tradition. Married women are expected to be accompanied or get permissions by their husband when they go outside. Physical activity during leisure time is not convenient for women. In addition, women are expected to do housework or caregiving at home due to their gender roles, and they often do not have time for leisure activities, particularly women in older generations.[32]

Older women without social participation were more likely to be in the high risk class, but that was not significant for men. Participation in arisan may increase access to health-related information and social interaction with friends. Although participating in arisan is popular, some married women may not be able to participate because married women have lower autonomy.[25] The arisan may be the only opportunity for older women to engage socially, whereas men have more chances in participate in other kinds of groups.

There are some limitations in this study. First, some HRB variables were unavailable in this data. Second, we only used a cross-sectional data to examine the association between HRBs and related factors, because the three HRB variables were either unavailable or the measurement was inconsistent across the IFLS waves. The causal relationship could not be confirmed. Third, the differences in diet due to religion belief was not considered because of limited cases.

The HRB patterns of older adults in Indonesia are identified. Gender differences imply that health inequality may exist. A gender-sensitive health promotion policy is suggested for the government.

Ethics approval

The study was approved by the Joint IRB committee of Taipei

Medical University before the study was conducted (TMU-JIRB No. N202004087).

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Conflict of interests

The authors declare that they have no conflict of interests.

Supplementary materials

Supplementary materials for this article can be found at http://www.sgecm.org.tw/ijge/journal/view.asp?id=20.

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